

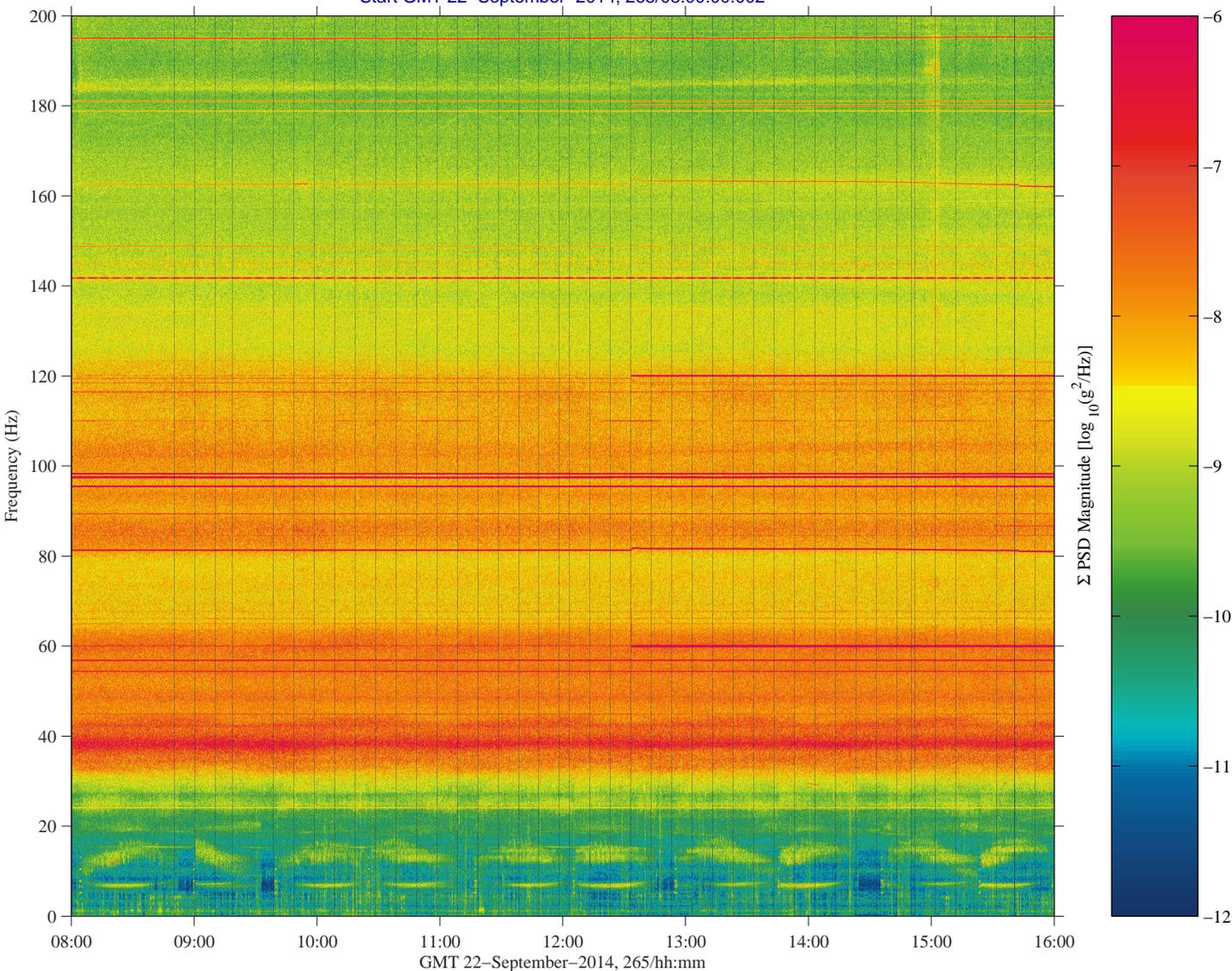
# GLACIER Start-Ups Qualify

sams2, 121f03 at LAB1O1, ER2, Lower Z Panel:[191.54 -40.54 135.25]  
500.0000 sa/sec (200.00 Hz)  
 $\Delta f = 0.122$  Hz, Nfft = 4096  
Temp. Res. = 8.192 sec, No = 0

sams2, 121f03

Start GMT 22-September-2014, 265/08:00:00.002

Sum  
Hanning, k = 3515  
Span = 8.00 hours



from: /misc/yoda/pub/pad, pims, 24-Sep-2014,07:37:27.612

Description	
Sensor	SAMS 121f03 500.0 sa/sec, 200.0 Hz
Location	LAB1O1, ER2, Lower Z Panel
Plot Type	Spectrogram

### Notes:

- This color spectrogram shows the start-up of GLACIER-1 cooling operations at about GMT 22-Sep-2014 12:33.
- This GLACIER-1 is located in EXPRESS Rack 2, Locker 4, while the SAMS sensor measurements that were used to compute this spectrogram were taken on the lower Z-panel of this same rack.
- The vibratory start-up signature is seen as the brightening of the red horizontal traces at 60 Hz, 120 Hz, and the start of a weaker trace at 180 Hz.

Regime:	Vibratory
Category:	Equipment
Source:	GLACIER Start-Ups



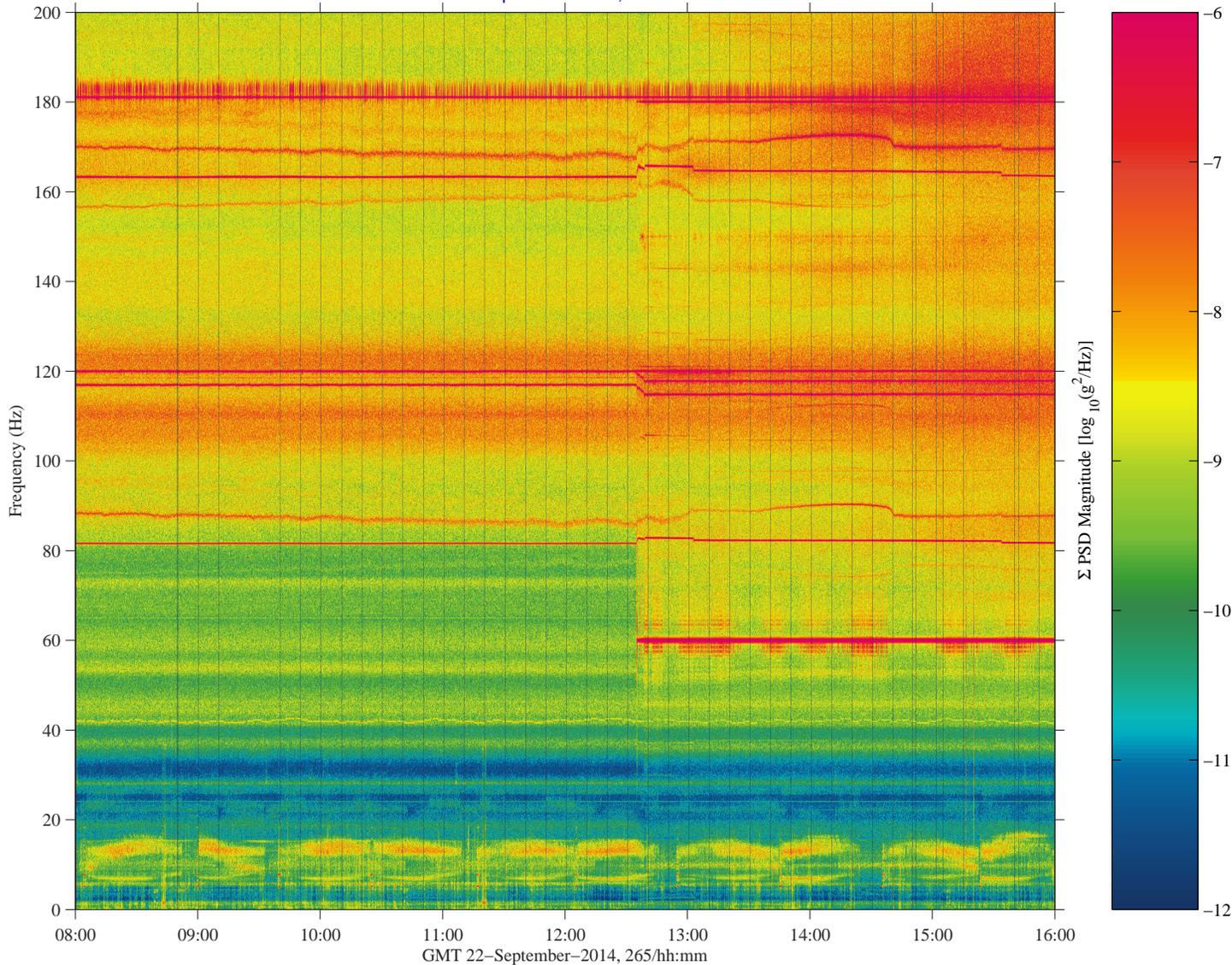
# GLACIER Start-Ups Qualify

sams2, 121f08 at COL1A1, ER3, Seat Track near D1:[371.17 193.43 165.75]  
500.0000 sa/sec (200.00 Hz)  
 $\Delta f = 0.122$  Hz, Nfft = 4096  
Temp. Res. = 8.192 sec, No = 0

sams2, 121f08

Start GMT 22-September-2014, 265/08:00:00.001

Sum  
Hanning, k = 3515  
Span = 8.00 hours



from: /misc/yoda/pub/pad, pims, 24-Sep-2014,08:19:59.571

## Description

Sensor	SAMS 121f08 500.0 sa/sec, 200.0 Hz
Location	COL1A1, ER3, Seat Track near D1
Plot Type	Spectrogram

## Notes:

- This color spectrogram shows the start-up of GLACIER-3 cooling operations at about GMT 22-Sep-2014 12:35.
- This GLACIER-3 is located in EXPRESS Rack 3, Locker 2, while the SAMS sensor measurements that were used to compute this spectrogram were taken on a seat track mounted adjacent to the GLACIER location.
- The vibratory start-up signature is loud and clear and can be seen as the sudden start of a thick, red horizontal streak at 60 Hz, with notable changes at 120 Hz, and the start of a weaker trace at 180 Hz too.

Regime:	Vibratory
Category:	Equipment
Source:	GLACIER Start-Ups



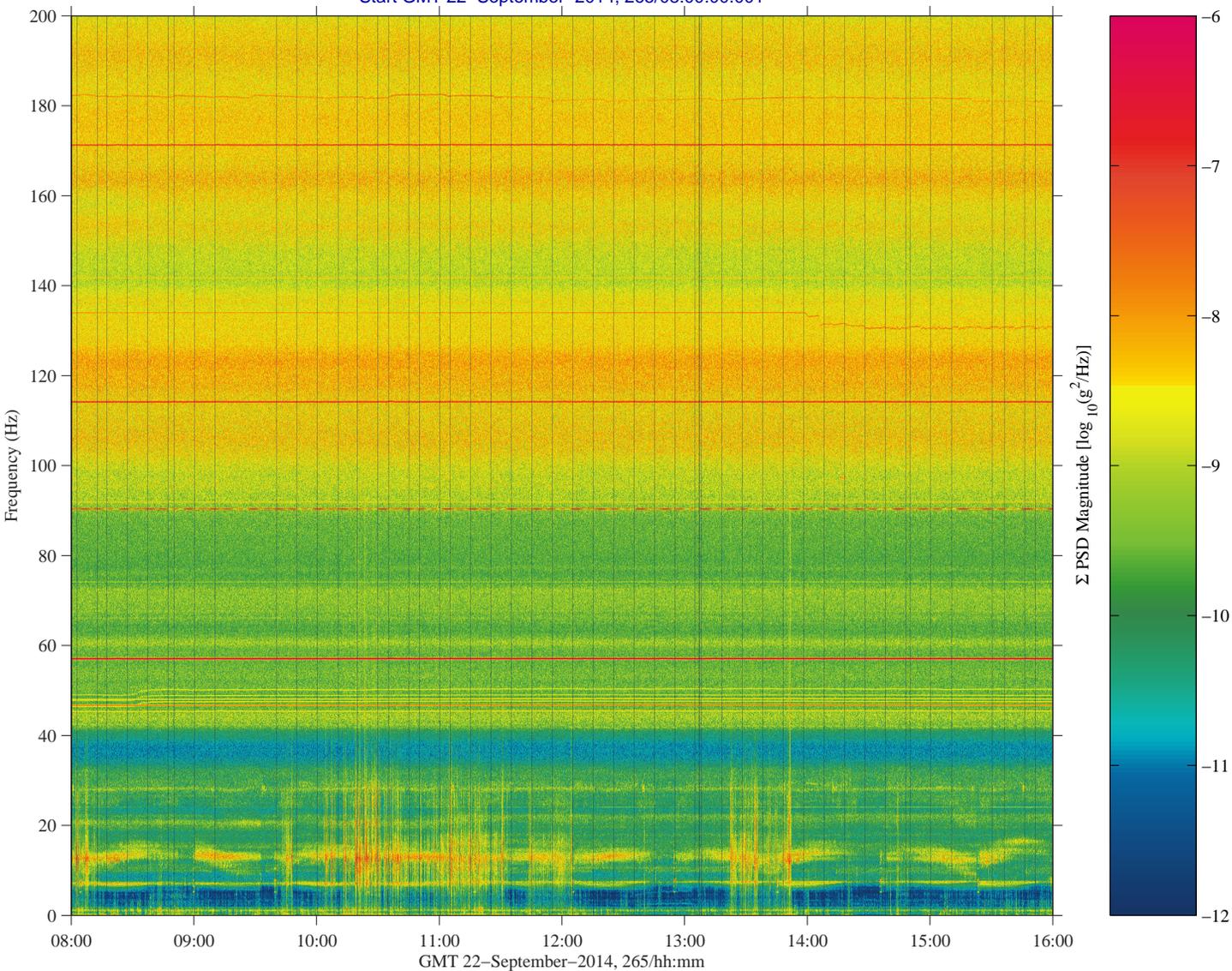
# GLACIER Start-Ups Qualify

sams2, 121f05 at JPM1F5, ER4, Drawer 2:[466.80 -292.06 214.58]  
 500.0000 sa/sec (200.00 Hz)  
 $\Delta f = 0.122$  Hz, Nfft = 4096  
 Temp. Res. = 8.192 sec, No = 0

sams2, 121f05

Start GMT 22-September-2014, 265/08:00:00.001

Sum  
 Hanning, k = 3515  
 Span = 8.00 hours



from: /misc/yoda/pub/pad, pims, 24-Sep-2014,08:04:51.088

Description	
Sensor	SAMS 121f05 500.0 sa/sec, 200.0 Hz
Location	JPM1F5, ER4, Drawer 2
Plot Type	Spectrogram

- Notes:**
- For completeness, and in order to do crude check if this disturbance propagated to the JEM, this color spectrogram was produced.
  - This spectrogram was computed from SAMS sensor measurements in the JEM and shows no signs of either GLACIER start-up from neither the USL nor from COL.

Regime:	Vibratory
Category:	Equipment
Source:	GLACIER Start-Ups

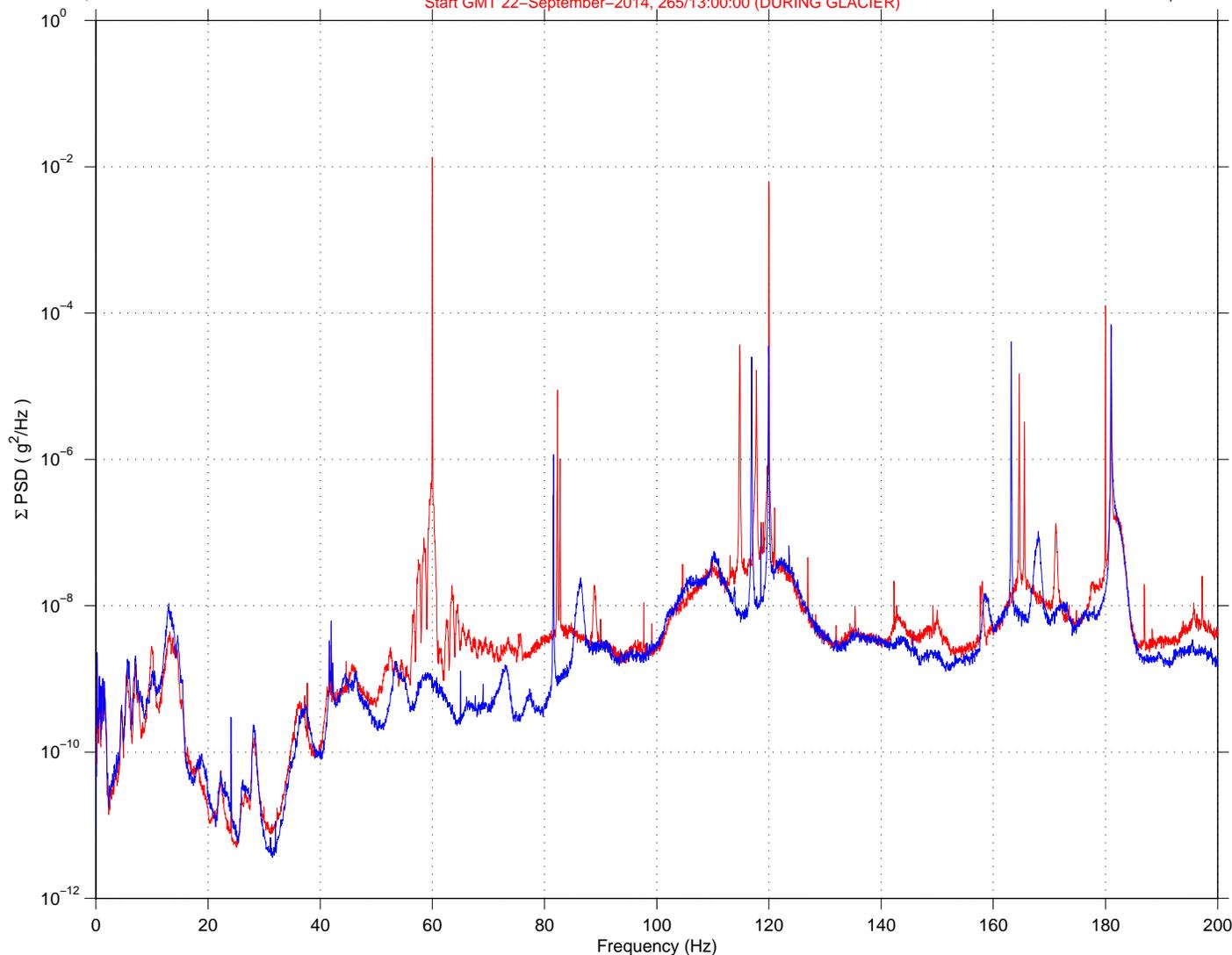


# GLACIER Start-Ups Qualify

sams2, 121f08 at COL1A1, ER3, Seat Track near D1:[371.17 193.43 165.75]  
500.0000 sa/sec (200.00 Hz)  
 $\Delta f = 0.031$  Hz, Nfft = 16384  
P = 49.1%, No = 8048

SAMS2, 121f08, COL1A1, ER3, Seat Track near D1, 200.0 Hz (500.0 s/sec)  
Start GMT 22-September-2014, 265/11:30:00 (BEFORE GLACIER)  
Start GMT 22-September-2014, 265/13:00:00 (DURING GLACIER)

Sum  
Hanning, k = 107  
Span = 1800.00 sec.



## Description

Sensor	SAMS 121f08 500.0 sa/sec, 200.0 Hz
Location	COL1A1, ER3, Seat Track near D1
Plot Type	Power Spectral Density

### Notes:

- The 2 traces on this plot of power spectral density (PSD) show a comparison of the acceleration spectrum for a half-hour span before GLACIER-3 cooling operations in the Columbus module.
- The blue trace was computed from a half-hour of SAMS measurements made in COL before GLACIER-3 started cooling, while the red trace was likewise, except that it came from a half-hour span during GLACIER-3 cooling ops.
- Notice the very large spectral peaks at 60 Hz, 120 Hz, and 180 Hz, which we attribute to reciprocating motion of linear pump needed to cool this unit down.

Regime:	Vibratory
Category:	Equipment
Source:	GLACIER Start-Ups



# GLACIER Start-Ups Quantify

sams2, 121f03 at LAB1O1, ER2, Lower Z Panel:[191.54 -40.54 135.25]  
500.0000 sa/sec (200.00 Hz)  
 $\Delta f = 0.031$  Hz, Nfft = 16384

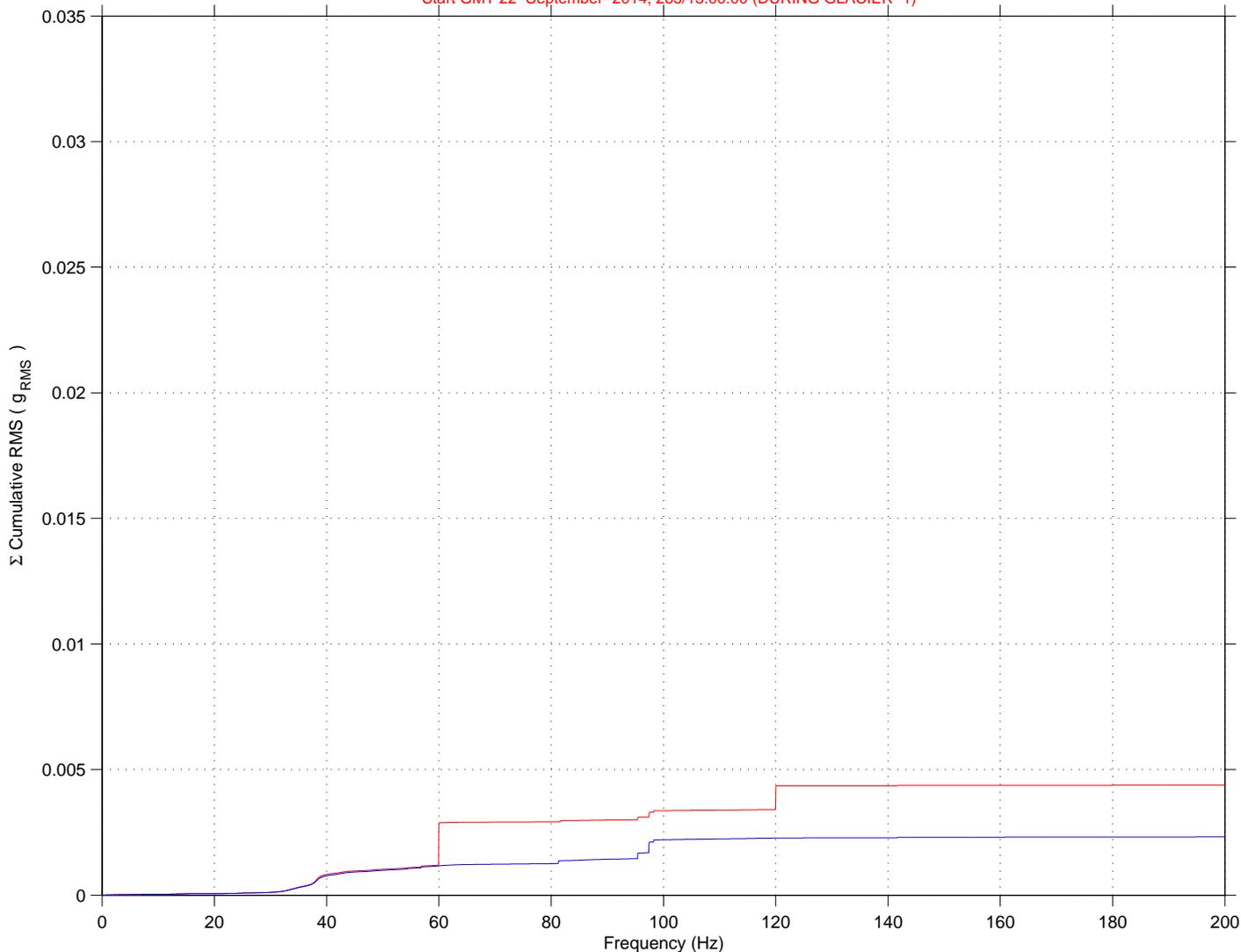
SAMS2, 121f03, LAB1O1, ER2, Lower Z Panel, 200.0 Hz (500.0 s/sec)  
Start GMT 22-September-2014, 265/11:30:00 (BEFORE GLACIER-1)  
Start GMT 22-September-2014, 265/13:00:00 (DURING GLACIER-1)

Sum  
Hanning, k = 107  
Span = 1800.00 sec.

Description	
Sensor	SAMS 121f03 500.0 sa/sec, 200.0 Hz
Location	LAB1O1, ER2, Lower Z Panel
Plot Type	Cumulative RMS vs. Frequency

### Notes:

- This plot of cumulative RMS versus frequency shows 2 traces: (1) a blue trace before GLACIER-1 was operating, and (2) a red trace during GLACIER-1 operations.
- Note the large steps at 60 Hz and 120 Hz on the red trace that helps quantify the impact of GLACIER-1 operations from SAMS sensor 121f03 measurements in EXPRESS Rack 2 in the US Lab.



Regime:	Vibratory
Category:	Equipment
Source:	GLACIER Start-Ups

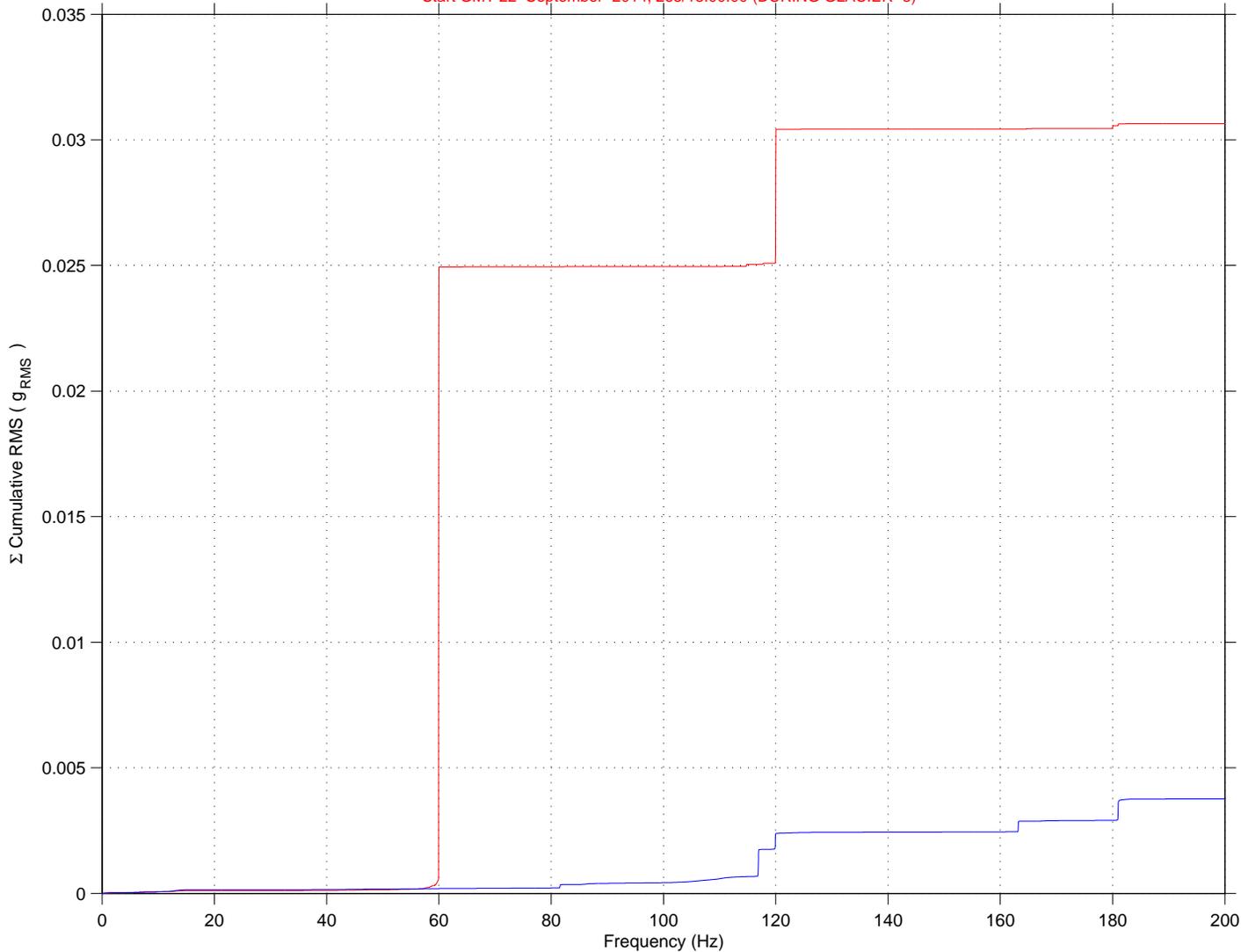


# GLACIER Start-Ups Quantify

sams2, 121f08 at COL1A1, ER3, Seat Track near D1:[371.17 193.43 165.75]  
500.0000 sa/sec (200.00 Hz)  
 $\Delta f = 0.031$  Hz, Nfft = 16384

SAMS2, 121f08, COL1A1, ER3, Seat Track near D1, 200.0 Hz (500.0 s/sec)  
Start GMT 22-September-2014, 265/11:30:00 (BEFORE GLACIER-3)  
Start GMT 22-September-2014, 265/13:00:00 (DURING GLACIER-3)

Sum  
Hanning, k = 107  
Span = 1800.00 sec.



## Description

Sensor	SAMS 121f08 500.0 sa/sec, 200.0 Hz
Location	COL1A1, ER3, Seat Track near D1
Plot Type	Cumulative RMS vs. Frequency

### Notes:

- This plot of cumulative RMS versus frequency shows 2 traces: (1) a blue trace before GLACIER-3 was operating, and (2) a red trace during GLACIER-3 operations.
- Note the large steps, particularly at 60 Hz and 120 Hz on the red trace that helps quantify the impact of GLACIER-3 operations from SAMS sensor 121f08 measurements in EXPRESS Rack 3 in the Columbus module.

Regime:	Vibratory
Category:	Equipment
Source:	GLACIER Start-Ups

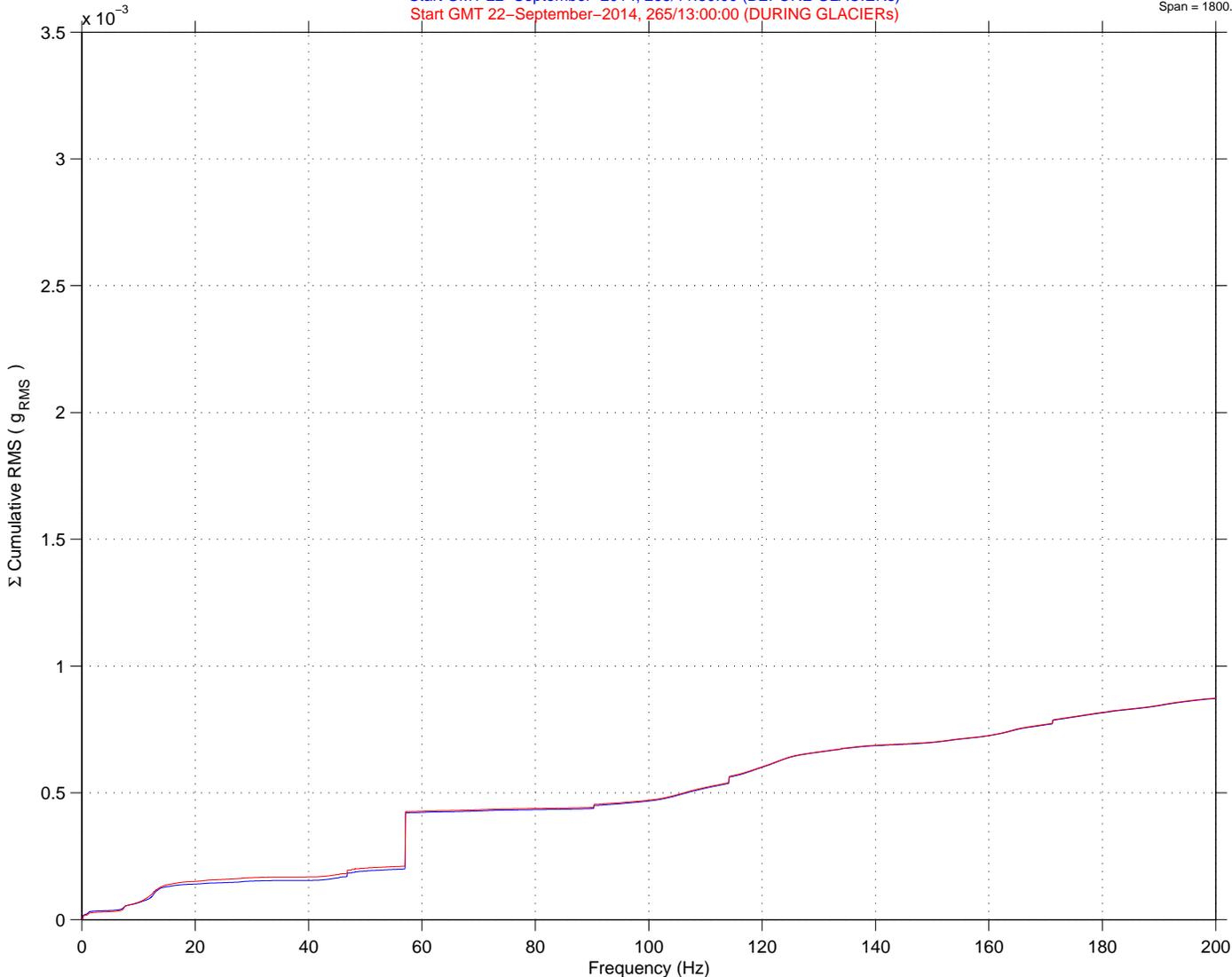


# GLACIER Start-Ups Quantify

sams2, 121f05 at JPM1F5, ER4, Drawer 2:[466.80 -292.06 214.58]  
500.0000 sa/sec (200.00 Hz)  
 $\Delta f = 0.031$  Hz, Nfft = 16384

SAMS2, 121f05, JPM1F5, ER4, Drawer 2, 200.0 Hz (500.0 s/sec)  
Start GMT 22-September-2014, 265/11:30:00 (BEFORE GLACIERs)  
Start GMT 22-September-2014, 265/13:00:00 (DURING GLACIERs)

Sum  
Hanning, k = 54  
Span = 1800.00 sec.



Description	
Sensor	SAMS 121f05 500.0 sa/sec, 200.0 Hz
Location	JPM1F5, ER4, Drawer 2
Plot Type	Cumulative RMS vs. Frequency

### Notes:

- This plot of cumulative RMS versus frequency shows 2 traces: (1) a blue trace before both GLACIER-1 and GLACIER-3 were operating, and (2) a red trace during both GLACIER-1 and GLACIER-3 operations.
- Note from these traces derived from SAMS sensor 121f05 measurements in EXPRESS Rack 4 in the Japanese laboratory module (the JEM) that the GLACIER signatures did not measurably propagate from either the Columbus module or the US Lab to the JEM.

Regime:	Vibratory
Category:	Equipment
Source:	GLACIER Start-Ups



## GLACIER Start-Ups Ancillary Notes

To summarize the impact of GLACIER ops, we saw that GLACIER-1 in ER2 Locker 4 in USL showed up with strong, narrowband spectral components at 60, 120, and 180 Hz in the nearby SAMS sensor 121f03 data. Likewise, the GLACIER-3 in ER3 Locker 2 in COL registered with very strong, narrowband spectral components at 60, 120, and 180 Hz in the SAMS sensor 121f08 data, which was mounted very close to this GLACIER-3. We saw no noticeable propagation from either GLACIER-1 or from GLACIER-4 to the SAMS sensor 121f05 in the JEM.

We also quantified the impact of these GLACIERS at the nearby SAMS sensor locations using cumulative RMS versus frequency plots. The large steps at 60, 120, and less so at 180 Hz we attribute to the fundamental frequency of the linear pump that works to cool GLACIER contents.

